

Bees (Hymenoptera: Anthophila) of a Riverside Outcrop Prairie in Fairfax County, Virginia

Brent W. Steury

U.S. National Park Service
700 George Washington Memorial Parkway
Turkey Run Park Headquarters
McLean, Virginia 22101

Sam W. Droege

USGS Patuxent Wildlife Research Center
BARC East, Building 308, Room 124
10300 Baltimore Avenue
Beltsville, Maryland 20705

Erik T. Oberg

U.S. National Park Service
700 George Washington Memorial Parkway
Turkey Run Park Headquarters
McLean, Virginia 22101

ABSTRACT

The bees (Hymenoptera: Anthophila) of a riverside outcrop prairie in Fairfax County, Virginia were surveyed twice monthly from June-October 2007 and March-May 2008. Capture methods included bee bowl transects and netting. A total of 91 taxa in 28 genera and five families was documented. These include the first Virginia records for *Andrena nida* Mitchell (Andrenidae) and *Coelioxys immaculata* Cockerell (Megachilidae) and the second Virginia record of *Melecta pacifica atlantica* Linsley (Apidae). The relative abundance of each species captured is recorded. Plant associations are given for each species netted.

Key words: Apoidea, bees, Fairfax County, national park, pollination, prairie, Virginia.

INTRODUCTION

The ecological importance of bees as pollinators and their economic importance in the production of fruits and vegetables has been recognized since the late seventeenth century (Proctor et al., 1996), yet the bee fauna of Virginia remains poorly known. Virginia bee records can be gleaned from general texts on bees of North America (Mitchell, 1960, 1962; Hurd, 1979), generic revisions (LaBerge & Ribble, 1972; Baker, 1975), pollination studies conducted in the Commonwealth (Ivey et al., 2003; Shuler et al., 2005)

or unpublished distributional data (Ascher & Droege, 2009).

During the June 2006 Potomac Gorge Bioblitz, *Anthidiellum notatum* (Latreille), a bee previously unknown from Virginia (Evans, 2008), was collected by Craig Tufts and Hormuzd Katki from the riverside outcrop prairie vegetation zone (sensu Fleming, 2007) in Great Falls Park, Virginia. Suspecting that other rare bees might inhabit this globally rare plant community type, a systematic inventory of the associated bee fauna was begun in June 2007. The results of that study are presented herein.

STUDY SITE

The study site is the largest contiguous area (0.5 ha) of riverside outcrop prairie located in the 323 ha Great Falls Park in Fairfax County, Virginia (38°59'40.90" N, 77°15'04.71"W). It lies in the Piedmont physiographic province, approximately 13 km northwest of the center of Washington, DC. The area is administered by the National Park Service as a unit of the George Washington Memorial Parkway.

The riverside outcrop prairie occurs naturally in patches that cover a total area of only one hectare. Despite its small size, the prairie contains 283 vascular plant taxa, accounting for the richest plant community in Great Falls Park, which contains more than 1,015 total vascular plant taxa (Steury et al., 2008). One additional species, *Geranium maculatum* (author citations are given in Table 2), was added during this study to the riverside outcrop prairie flora. The prairie occupies bedrock terraces on the western rim of the Potomac River Gorge and is subject to considerable scour during major floods that stunt the growth of woody species and maintain a predominately herbaceous plant community. Although the site contains persistent pools, it is often seasonally xeric. It is located 14 to 17 m above mean water level and has a flood return interval estimated at 7 years (Lea, 2000). The vegetation is patchy because of frequent areas of exposed bedrock, but is locally dense where soil is present. Woody vegetation consists of low shrubs and stunted trees less than 10 m tall. In fall, the prairie is dominated by the warm-season grasses *Andropogon gerardii* Vitman, *Sorghastrum nutans* (L.) Nash, and *Schizachyrium scoparium* (Michx.) Nash, and stunted *Fraxinus americana* L. The surrounding vegetation includes deciduous woodlands and herbaceous shoreline plant communities.

Riverside outcrop prairies are a globally-rare vegetation type known only from scattered sites along both sides of the Potomac River Gorge in Maryland and Virginia and from stretches of the Shenandoah River in Virginia (Fleming, 2007). The plant community is classified within the United States National Vegetation Classification as Piedmont/Central Appalachian Riverside Outcrop Prairie: *Fraxinus americana*/*Andropogon gerardii* – *Sorghastrum nutans* – *Schizachyrium scoparium* – *Pycnanthemum tenuifolium* Herbaceous Vegetation (Grossman et al., 1998).

MATERIALS AND METHODS

Twice monthly, from 13 June to 1 November 2007 and 5 March to 23 May 2008, a transect consisting of 50 3.25 oz. Solo brand soufflé cups spaced

approximately five meters apart was run. The white cups were painted fluorescent yellow, fluorescent blue, or left non-fluorescent white. The cups were filled with a dilute detergent mixture of one gallon of water and a squirt of liquid, unscented, Dawn Blue® or Planet® brand dishwashing detergent. Cups of the three colors were alternated in a transect that was oriented across the broadest width of the prairie. Transect routes varied slightly with each set. The average set time was 24 hours. Sets were planned to coincide with weather forecasts of sunny days and no rain. Opportunistic netting of bees was conducted for approximately one hour on the date of each set and recovery in order to optimize the number of captures (Roulston et al., 2007). Netted specimens were placed in killing jars containing ethyl acetate or tetrachlorethane. The species of plant on which each bee was netted was recorded. Bees collected in cups were filtered through a fine mesh 12.5 x 15 cm minnow net, stored in Whirl-packs with 70% ethyl alcohol, washed in warm water and dried with blotter paper. All specimens were pinned and deposited in the collection at the George Washington Memorial Parkway, Turkey Run Headquarters. Bees were identified using the Discover Life guide online at <http://www.discoverlife.org/mp/20q?search=Apoidea>.

RESULTS AND DISCUSSION

A total of 91 bee taxa in 28 genera and five families was documented (Table 1). Seven taxa were not determined to species due to difficulties in separating taxonomically similar species. These are identified to genus and the most closely related species or group is given in parentheses. Male specimens of *Andrena alleghaniensis* (author citations are given in Table 1) were indistinguishable from those of *A. atlantica* to the authors, so these are combined in the list of species. No additional specimens of *Anthidiellum notatum* were found during this study. The most species-rich family of bees found in the riverside prairie was Halictidae (25 taxa in seven genera), followed by Apidae (23/11), Andrenidae (21/2), Megachilidae (19/6), and Colletidae (3/2). The most species-rich genera were *Andrena* (20), *Lasioglossum* (18), *Osmia* (9), *Nomada* (7), and *Bombus* (5). The most commonly collected bees in the riverside outcrop prairie were *Lasioglossum quebecense* (162), *Andrena erigeniae* (95), *Ceratina calcarata* (63), *C. strenua* (56), *L. tegulare* (45), *Hoplitis producta* (33), and *Augochlorella aurata* (32). A total of 145 *L. quebecense* was captured in bee bowls during 9-10 April 2008. Based on total captures during each month, bees are most active in the riverside prairie in April (437 captures), May (154), July (117), and August (87). Bee bowls set on 17-18 March 2008 failed to capture

any bees and none were netted on those days; however, single specimens of *A. erigeniae* and *L. quebecense* were captured during 5-6 March 2008. Of the 91 total taxa, 28 are represented by one specimen. Twenty taxa were collected only by netting, including nine species of *Andrena*, two *Nomada*, and one species each of *Bombus*, *Ceratina*, *Coelioxys*, *Colletes*, *Halictus*, *Lasioglossum*, *Melissodes*, *Osmia*, and *Xylocopa*.

Inventories in a superficially similar habitat type using seven Malaise traps near Flintstone, Maryland, 160 km (100 miles) northwest of Great Falls, produced 60 species and 27 morphospecies in 16 genera over three years (Kalhorn et al., 2003). Only 20.2% of the species overlapped in the two studies.

Bees were netted on 41 plant taxa in 20 families within the riverside prairie, including 30 herbs and 11 shrubs or small trees (Table 2). The largest number of associations was documented for the Asteraceae (11 species), followed by five species of Rosaceae, and three species each of Ericaceae, Fabaceae, and Scrophulariaceae. More bee taxa were captured on *Cerastium arvense* ssp. *velutinum* var. *velutinum* (17 bee taxa) than on any other plant. Bees were captured on three non-native plant species: *Pyrus calleryana*, *Ranunculus bulbosus*, and *Rosa multiflora*. Thirteen bee taxa were captured during 9-10 April 2008 on one *P. calleryana* tree. The attractiveness of this non-native tree to native bees is an indication of how non-native plants may draw native pollinators, thus benefiting native plants in the community (Stubbs et al., 2007). However, Totland et al. (2006) documented strong negative impacts on the pollinator visitation rates to native plants when an exotic plant was introduced to a native plant community. Other plants in the riverside prairie that were visited by multiple bee taxa were *Symphoricarpon patens* (10 taxa), *Cephalanthus occidentalis* and *Solidago simplex* ssp. *randii* var. *racemosa* (7 taxa each), and *Pycnanthemum tenuifolium* (5 taxa).

Fairfax is the only known Virginia county with populations of the state-rare goldenrod *Solidago simplex* ssp. *randii* var. *racemosa* (Wieboldt et al., 2007). Bees documented on this plant were *Apis mellifera*, *Augochlora pira*, *Augochlorella aurata*, *Bombus impatiens*, *Ceratina calcarata*, *C. strenna*, and *Lasioglossum quebecense*.

Based on lack of documentation in Robertson (1929), Mitchell (1960, 1962), Hurd (1979), Moure & Hurd (1987), and Ascher & Droege (2009), rare associations between seven bee taxa and various plant genera were observed, including *Augochlorella aurata* (*Allium* and *Euphorbia*), *Bombus perplexus* (*Polygonum*), *Ceratina calcarata* (*Agalinis*), *Lasioglossum tegulare* (*Spiraea*), *Megachile mendica*

(*Agalinis*, *Allium*, and *Veronicastrum*), *Osmia collinsiae* (*Lythrus*), and *Osmia subfasciata* (*Vicia*).

According to eastern North American bee distribution data maintained by Ascher & Droege (2009), and reviews of Mitchell (1960, 1962), LaBerge & Ribble (1972), Baker (1975), and Hurd (1979), this survey documented the first Virginia records for *Andrena nida* Mitchell (Andrenidae) and *Coelioxys immaculata* Cockerell (Megachilidae) and the second record of *Melecta pacifica atlantica* Linsley (Apidae) from the Commonwealth.

Andrena nida was previously documented from Vermont to northern Florida, and west to Mississippi and Missouri (Pascarella, 2008; Ascher & Droege, 2009). It has been recorded as active between 10 March and 15 May (Mitchell, 1960; LaBerge, 1972). Often considered an oligolege of *Salix* (Pascarella, 2008), one male was collected on 9 April in the Great Falls riverside prairie on the non-native tree *Pyrus calleryana*. Mitchell (1960) records this bee from a nest site in sand near a creek and cites collections of males on *Prunus* and *Amelanchier* in North Carolina. Pascarella (2008) recorded the first Florida record on *Prunus angustifolia* Marshall, further evidence that males often forage on members of the Rosaceae.

Coelioxys immaculata is a cleptoparasite of *Megachile addenda* (Michener et al., 1994; Cane et al., 1996) and is documented in the Midwestern states from Kansas to Texas and along the East Coast from Massachusetts to central Florida (Pascarella, 2008; Ascher & Droege, 2009). It has been recorded as early as 30 March in Florida and as late as 14 July in Massachusetts (Baker, 1975). It forages on *Asclepias*, *Baptisia*, *Tephrosia*, *Rubus*, and *Vaccinium* (Mitchell, 1962; Cane et al., 1996). In the riverside prairie, single males were captured on 5 and 23 May on *Vaccinium stamineum* and *Rubus flagellaris*, respectively.

Melecta pacifica atlantica is a cleptoparasite of *Anthophora* (Michener et al., 1994), known from New Jersey to Kansas, south to Alabama and Georgia (Ascher & Droege, 2009). It flies from March to May and is documented on *Fragaria*, *Lithospermum*, and *Pentstemon* (Mitchell, 1962). The only species of *Anthophora* found in the riverside prairie was *A. ursina*. During this study, one female *M. pacifica atlantica* was captured in a bee bowl set on 23-24 April 2008. The only other specimen record for Virginia was collected on 22 April 2003 near Charlottesville by Ruth Douglas.

Anthophora ursina is also rarely collected in Virginia (Droege, pers. obs.). Although apparently absent from the central United States, this species is found in most western states north to Washington and Wyoming and south to Arizona and New Mexico. In the East, it is known west to Illinois and along the East

Table 1. Bee taxa documented during this study. Nomenclature follows Ascher & Droege (2009). The earliest and latest dates of collection are reported, followed by plant associations using the letter-digit codes given in Table 2. Plant codes are followed by the number of individuals netted on the plant if >1. FL denotes specimens netted in flight. The total number of specimens is also reported for each taxon.

Short-tongued Bees

Family Andrenidae

<i>Andrena alleghaniensis</i> Viereck/ <i>A. atlantica</i> Mitchell	23 Apr; C3; 1♂
<i>Andrena banksi</i> Malloch	9 Apr; R3(19); 18♂, 1♀
<i>Andrena barbara</i> Bouseman & LaBerge	9-10 Apr; R3; 3♂, 1♀
<i>Andrena barbilabris</i> (Kirby)	9-24 Apr; R3; 2♂
<i>Andrena bradleyi</i> Viereck	23 Apr; E2; 1♀
<i>Andrena carlini</i> Cockerell	9-24 Apr; E2; 13♀
<i>Andrena cressonii</i> Robertson	23 Apr-23 May; C3(3); 2♂, 2♀
<i>Andrena erigeniae</i> Robertson	5 Mar-6 May; C3; 5♂, 90♀
<i>Andrena forbesii</i> Robertson	23 Apr; C3; 1♀
<i>Andrena imitatrix</i> Cresson	9 Apr; R3; 1♂
<i>Andrena miserabilis</i> Cresson	9-24 Apr; C1, R3(5); 6♂
<i>Andrena nasonii</i> Robertson	9 Apr-23 May; C3(6), R3; 5♂, 11♀
<i>Andrena nida</i> Mitchell	9 Apr; R3; 1♂
<i>Andrena nigrae</i> Robertson	5-6 May; 1♀
<i>Andrena perplexa</i> Smith	23-24 Apr; C1, C3(2); 5♂, 1♀
<i>Andrena personata</i> Robertson	5 May; C3; 1♂
<i>Andrena tridens</i> Robertson	9 Apr-23 May; E1, E2; 4♀
<i>Andrena vicina</i> Smith	23-24 Apr; C3, E2; 1♂, 2♀
<i>Andrena violae</i> Robertson	9 Apr-6 May; 1♂, 7♀
<i>Andrena</i> sp. (<i>Trachandrena</i> or <i>Scrapteropsis</i> group)	9 Apr; R3; 1♂
<i>Calliopsis andreniformis</i> Smith	11-12 Jul; 1♂

Family Colletidae

<i>Colletes inaequalis</i> Say	9-10 Apr; 1♂, 1♀
<i>Colletes thoracicus</i> Smith	23 Apr; C1; 1♂
<i>Hylaenus</i> sp. (subgenus <i>Prosopsis</i>)	28 Jun-12 Jul; 2♀

Family Halictidae

<i>Agapostemon virescens</i> (Fabricius)	27-28 Aug; 1♂
<i>Augochlora pura</i> (Say)	28 Jun-Oct 4; A8, A10, A11, A12, R7; 2♂, 9♀
<i>Augochlorella aurata</i> (Smith)	9 Apr-25 Sep; A3, A4, A10, E4, L3; 2♂, 30♀
<i>Augochloropsis metallica</i> (Fabricius)	23-24 Jul; 1♂
<i>Halictus ligatus</i> Say	23 Jul-24 Sep; A11; 2♂, 1♀
<i>Halictus rubicundus</i> (Christ)	24 Sep; A5; 1♀
<i>Lasioglossum admirandum</i> (Sandhouse)	13 Jun-1 Nov; R6; 12♀
<i>Lasioglossum atlanticum</i> (Mitchell)	9 Apr-23 May; R5; 7♀
<i>Lasioglossum bruneri</i> (Crawford)	23 Apr-1 Nov; 14♀
<i>Lasioglossum coernleum</i> (Robertson)	9-10 Apr; 2♀
<i>Lasioglossum cressonii</i> (Robertson)	9 Apr-1 Nov; 13♀
<i>Lasioglossum fuscipenne</i> (Smith)	31 Oct-1 Nov; 11♀
<i>Lasioglossum imitatum</i> (Smith)	23-24 Apr; 1♀
<i>Lasioglossum laevissimum</i> (Smith)	28-29 Jun; R7; 2♀
<i>Lasioglossum oblongum</i> (Lovell)	11 Jul-9 Aug; 2♀
<i>Lasioglossum pilosum</i> (Smith)	11 Jul-1 Nov; 11♀
<i>Lasioglossum planatum</i> (Lovell)	5-6 May; 1♀
<i>Lasioglossum platyparium</i> (Robertson)	9-10 Apr; 1♀
<i>Lasioglossum quebecense</i> (Crawford)	5 Mar-1 Nov; A10(2), A11; 162♀
<i>Lasioglossum rohweri</i> (Ellis)	13 Jun-28 Aug; 9♀

Table 1 (continued).

<i>Lasioglossum tegulare</i> (Robertson, sensu Gibbs, 2009)	9 Apr-1 Nov; R6; 45♀
<i>Lasioglossum versatum</i> (Robertson)	23 Apr; C3; 1♀
<i>Lasioglossum zophops</i> (Ellis)	9-24 Apr; 2♀
<i>Lasioglossum</i> sp. (<i>viridatum</i> group)	8-9 Aug; 1♀
<i>Sphecodes atlantis</i> Mitchell	11-12 Sep; 1♀
Long-tongued Bees	
Family Apidae	
<i>Anthophora ursina</i> Cresson	9 Apr-5 May; F3(2); 4♂, 1♀
<i>Apis mellifera</i> Linnaeus	22 May-3 Oct; A1, A5(4), A9, A10(4), A11(3), C2, L1; 17♀
<i>Bombus bimaculatus</i> Cresson	28 Jun-12 Jul; L2, R7; 2♂, 1♀
<i>Bombus fervidus</i> (Fabricius)	11-12 Jul; 1♀
<i>Bombus griseocollis</i> (DeGeer)	28 Jun-12 Jul; L2, R7(2); 3♂
<i>Bombus impatiens</i> Cresson	28 Jun-4 Oct; A10, A11(2), R7(2), S2; 12♀
<i>Bombus perplexus</i> Cresson	28 Jun-12 Jul; L2, P2, R7(5); 6♂, 2♀
<i>Ceratina calcarata</i> Robertson	9 Apr-1 Nov; A3, A4(4), A6, A7, A9(2), A10, A11(4), E4, R1(2), R3, S2(2); 31♂, 32♀
<i>Ceratina dupla</i> Say	24-25 Sep; A6; 1♀
<i>Ceratina strenua</i> Smith	9 Apr-25 Sep; A2, A3, A10(7), A11, C3; 14♂, 42♀
<i>Melecta pacifica atlantica</i> Linsley	23-24 Apr; 1♀
<i>Melissodes subillata</i> LaBerge	3 Oct; A11; 1♂
<i>Melitoma taurea</i> (Say)	25 Sep-11 Jun; A5; 5♂, 3♀
<i>Nomada denticulata</i> Robertson	9-24 Apr; C3 1, R3(4); 5♂, 1♀
<i>Nomada imbricata</i> Smith	23 Apr-23 May; FL(2); 6♂
<i>Nomada huteoloides</i> Robertson	9 Apr; R3; 1♀
<i>Nomada maculata</i> Cresson	5 May; O1; 1♂
<i>Nomada</i> sp. 1 (near <i>cressonii</i> Robertson)	23 Apr-6 May; C3, R3; 2♂, 2♀
<i>Nomada</i> sp. 2 (near <i>pygmaea</i> Cresson)	23 Apr-23 May; E3(2); FL(1); 7♂, 3♀
<i>Nomada</i> sp. 3 (bidentate group)	9 Apr-23 May; C3(4); 10♂
<i>Peponapis pruinosa</i> (Say)	23 Jul-12 Sep; 1♂, 2♀
<i>Ptilothrix bombiformis</i> (Cresson)	11-24 Jul; 3♂
<i>Xylocopa virginica</i> (Linnaeus)	23 Apr-4 Oct; A7, A11, A12, R4; FL(2); 2♂, 4♀
Family Megachilidae	
<i>Anthidium oblongatum</i> (Illiger)	28 Jun-12 Sep; L2, L3(2); 3♂, 7♀
<i>Coelioxys immaculata</i> Cockerell	5-23 May; E3, R5; 2♂
<i>Coelioxys sayi</i> Robertson	28 Jun-24 Sep; A11; 4♂
<i>Hoplitis pilosifrons</i> (Cresson)	5-23 May; S3; 5♂, 1♀
<i>Hoplitis producta</i> (Cresson)	23 Apr-23 May; 30♂, 3♀
<i>Hoplitis spoliata</i> (Provancher)	22-23 May; 3♂
<i>Megachile addenda</i> Cresson	22-23 May; O2; 4♂, 2♀
<i>Megachile brevis</i> Say	22-23 May; 1♀
<i>Megachile mendica</i> Cresson	28 Jun-12 Sep; A5, A7, F2, L2(2), L3(2), R7(5), S2, S4; 21♂, 6♀
<i>Osmia atriventris</i> Cresson	9 Apr-22 May; C3, R5; 3♂, 6♀
<i>Osmia bucephala</i> Cresson	23 Apr-6 May; FL(1); 2♂, 3♀
<i>Osmia collinsiae</i> Robertson	9 Apr-23 May; F1, F3(2), G1; 3♂, 9♀
<i>Osmia conjuncta</i> Cresson	22-23 Apr; 1♂, 1♀
<i>Osmia cornifrons</i> (Radoszkowski)	9-10 Apr; R3; 2♂, 2♀
<i>Osmia lignaria</i> Say	22-23 May; 1♀
<i>Osmia pumila</i> Cresson	9 Apr-22 May; C3(2), G1(2), S3; 18♂, 6♀
<i>Osmia taurus</i> Smith	9-24 Apr; P1, R2, S1; 13♂, 2♀
<i>Osmia subfasciata</i> Cresson	5 May; F3; 1♀
<i>Stelis lateralis</i> Cresson	22-23 May; 2♂, 3♀

Table 2. Plants documented as nectar and pollen sources for bees netted in the riverside outcrop prairie. The letter-digit codes preceding the plant names correspond to those used in Table 1. Nomenclature follows Kartesz (1999). Non-native plants are denoted by an asterisk.

 ASCLEPIADACEAE

A1. *Asclepias verticillata* L.

ASTERACEAE

- A2. *Bidens aristosa* (Michx.) Britton
 A3. *Erigeron annuus* (L.) Pers.
 A4. *Eupatorium hyssopifolium* L.
 A5. *Eupatorium serotinum* Michx.
 A6. *Ionactis linariifolius* (L.) Greene
 A7. *Liatris spicata* (L.) Willd.
 A8. *Solidago bicolor* L.
 A9. *Solidago nemoralis* Aiton
 A10. *Solidago simplex* Kunth ssp. *randii* (Porter)
 Ringius var. *racemosa* (Greene) Ringius
 A11. *Symphotrichum patens* (Ait.) Nesom
 A12. *Symphotrichum pilosum* Wild. var. *pringlei*
 (A. Gray) S.F. Blake

CAPRIFOLIACEAE

C1. *Viburnum prunifolium* L.

CAMPANULACEAE

C2. *Lobelia puberula* Michx.

CARYOPHYLLACEAE

C3. *Cerastium arvense* L. ssp. *velutinum* (Raf.) Ugbor.
 var. *velutinum* (Raf.) Britton

ERICACEAE

- E1. *Rhododendron periclymenoides* (Michx.) Shinners
 E2. *Vaccinium corymbosum* L.
 E3. *Vaccinium stamineum* L.

EUPHORBIACEAE

E4. *Euphorbia corollata* L.

FABACEAE

- F1. *Lathyrus venosus* Muhl. ex Willd.
 F2. *Lespedeza capitata* Michx.
 F3. *Vicia caroliniana* Walter

GERANIACEAE

G1. *Geranium maculatum* L.

LAMIACEAE

- L1. *Lycopus virginicus* L.
 L2. *Pycnanthemum tenuifolium* Schrad.

LILIACEAE

L3. *Allium cernuum* Roth

OLEACEAE

O1. *Chionanthus virginicus* L.

ONAGRACEAE

O2. *Oenothera fruticosa* L.

POLEMONIACEAE

P1. *Phlox subulata* L.

POLYGONACEAE

P2. *Polygonum amphibium* L. var. *emersum* Michx.

RANUNCULACEAE

R1. *Ranunculus bulbosus* L.*

ROSACEAE

- R2. *Amelanchier arborea* (F. Michx.) Fernald
 R3. *Pyrus calleryana* Decne.*
 R4. *Rosa multiflora* Thunb.*
 R5. *Rubus flagellaris* Willd.
 R6. *Spiraea alba* Du Roi var. *latifolia* (Aiton) Dippel

RUBIACEAE

R7. *Cephalanthus occidentalis* L.

SAXIFRAGACEAE

S1. *Saxifraga virginiana* Michx.

SCROPHULARIACEAE

- S2. *Agalinis purpurea* (L.) Pennell
 S3. *Penstemon laevigatus* Aiton
 S4. *Veronicastrum virginicum* (L.) Farw.
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Coast between Rhode Island and Georgia (Ascher & Droege, 2009). It flies between March and June and has been recorded on *Azalea*, *Pedicularia*, *Pentstemon*, *Vaccinium*, and *Vicia* (Mitchell, 1962). Robertson (1929) recorded *A. ursina* on *Aesculus*, *Asclepias*, *Astragalus*, *Cercis*, *Collinsia*, *Delphinium*, *Dicentra*, *Dodecatheon*, *Geranium*, *Lithospermum*, *Lonicera*, *Mertensia*, *Monarda*, *Phlox*, *Physalis*, *Polygonatum*, *Polymonium*, *Ribes*, *Scutellaria*, *Trifolium*, and *Viola*. During this study, one male was taken in a bee bowl on 9-10 April 2008, and a male and a female were collected in bee bowls set on 23-24 April 2008. Two additional male specimens were taken on *Vicia caroliniana* on 23 April and 5 May 2008.

Additionally, records from Virginia of *Megachile addenda* are uncommon. Found across the southern United States from California to southern Florida, and north to Quebec and Ontario, Canada (Pascarella, 2008; Ascher & Droege, 2009), it has been recorded between April and July on *Amorpha*, *Baptisia*, *Hieraceum*, *Hypericum*, *Oenothera*, *Opuntia*, *Pentstemon*, *Polycodium*, *Psoralea*, *Rubus*, *Tephrosia*, and *Vaccinium* (Mitchell, 1962). Robertson (1929) adds records from *Asclepias*, *Coreopsis*, *Dianthera*, *Gillenia*, and *Rosa*. In the Mid-Atlantic area this species is almost entirely associated with open, xeric, sandy sites of the Coastal Plain with niches similar to those found on beaches and riverside prairies in the Potomac River Gorge. Similarly, the moth *Euxoa violaris* (Grote & Robinson), which is known only to inhabit areas of loose, shifting sand such as beach and dune areas along the Atlantic Coastal Plain, was found in the Piedmont physiographic province in Great Falls Park in 2006 (Steury et al., 2007). In the riverside prairie, six *M. addenda* were captured on 22-23 May 2008. One male was netted on *Oenothera fruticosa* and five additional specimens were captured in bee bowls.

The discovery of three bee species (*Andrena nida*, *Coelioxys immaculata*, and *Anthidiellum notatum*) new to the fauna of Virginia within an area of 0.5 ha over three years with a total search effort of less than three weeks seems to be an indication that the bee fauna of the Commonwealth remains poorly known. A Chao-2 estimate (Colwell & Coddington, 1994) calculated a total of 140 bee species within the riverside prairie compared to the sampling total of 91 taxa, suggesting that about a third of the actual fauna remains to be documented. As bee identification tools such as the Discover Life guides available online become more widely used and user friendly, it is expected that the knowledge of Virginia's bee fauna will continue to expand. Search efforts in rare habitat types may prove to be particularly productive.

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